

Figure 1
(prior art)

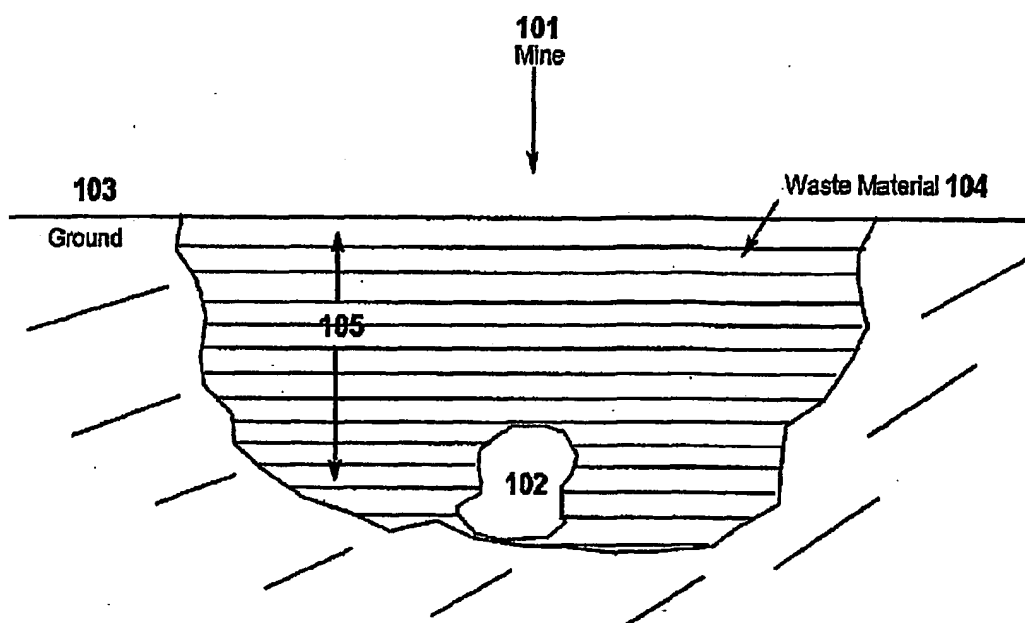


Figure 2
prior art

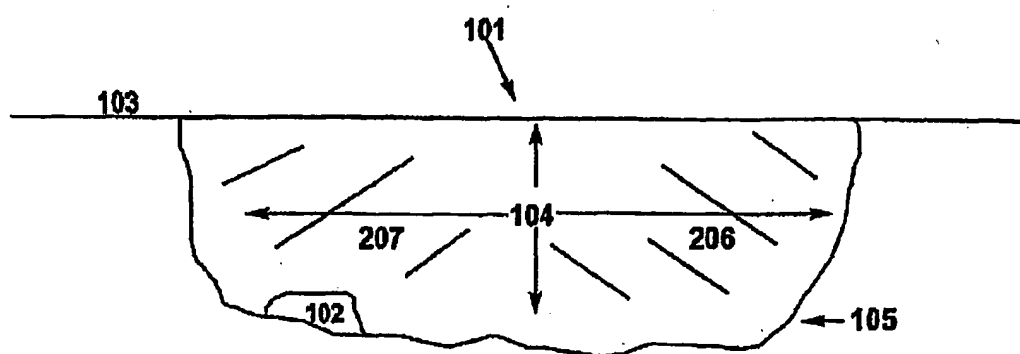


Figure 3
prior art

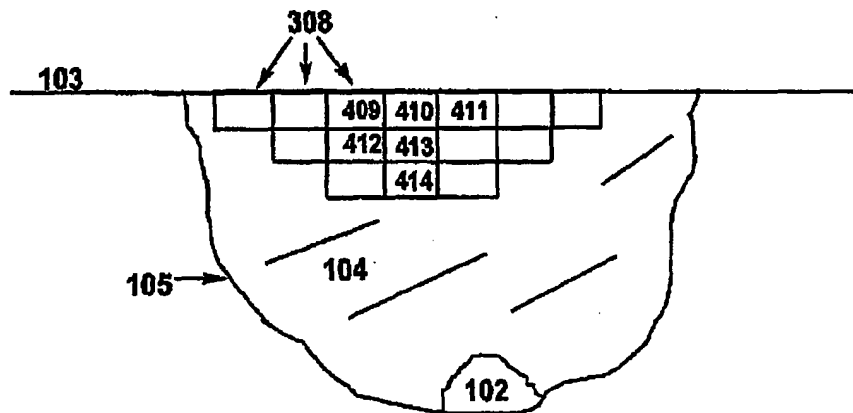
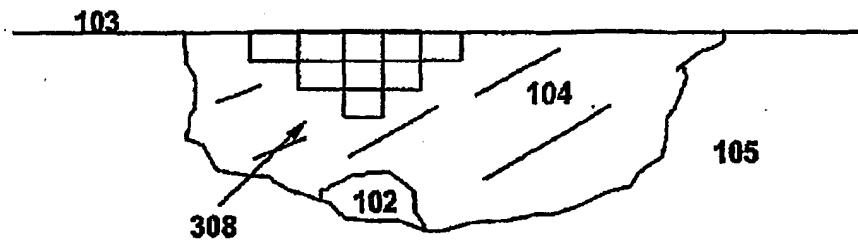
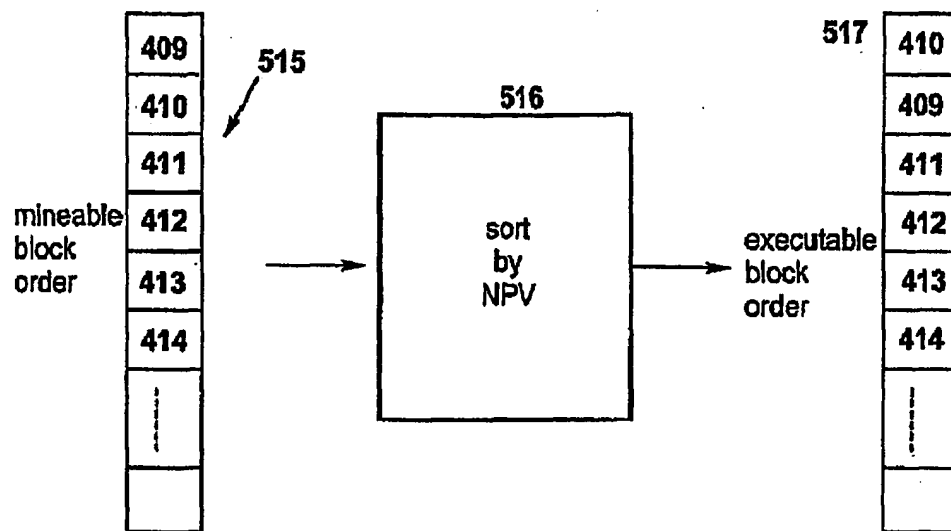


Figure 4
prior art

Figure 5
prior art



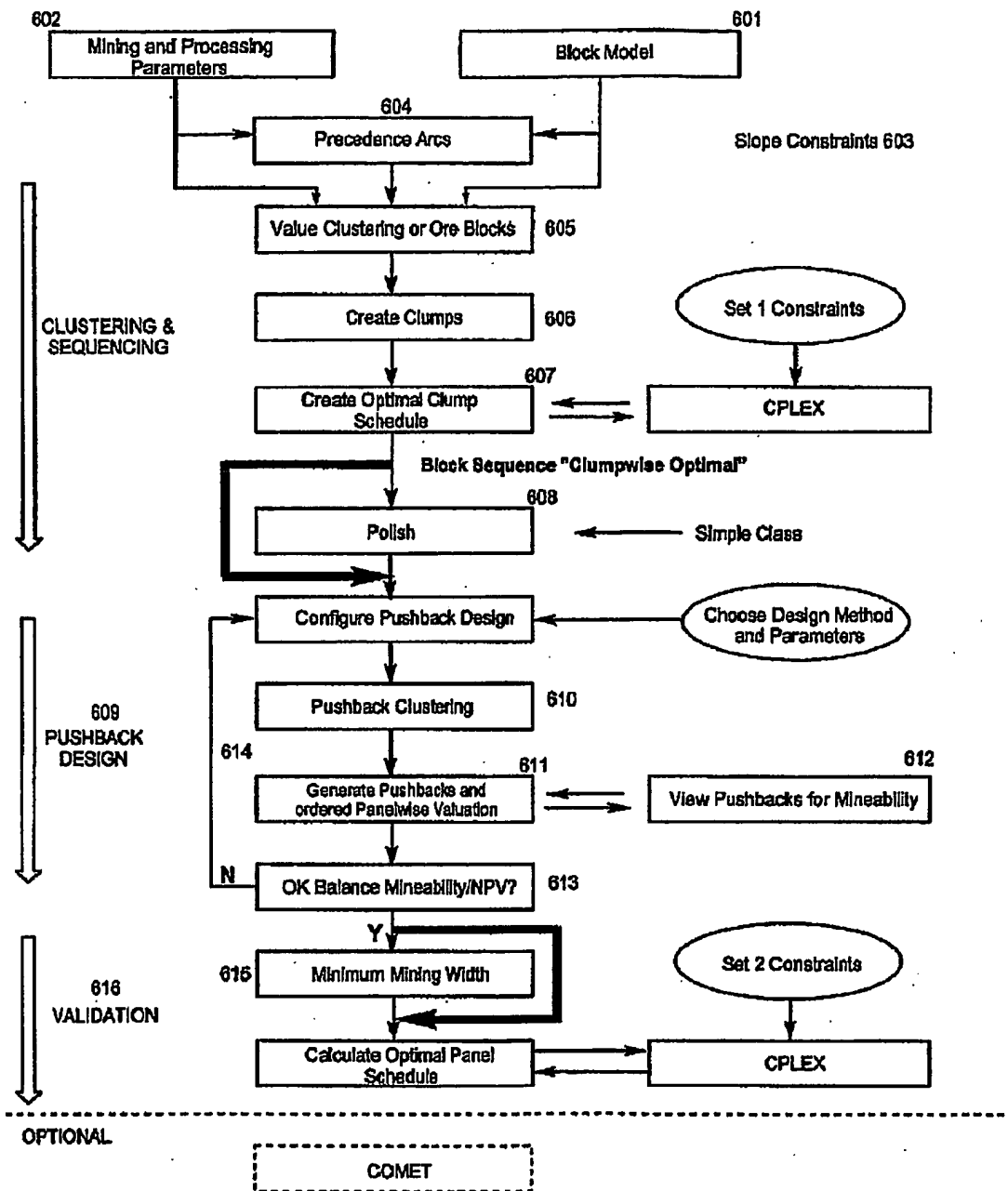


Figure 6 KlumpKing Top-Level Flow Chart

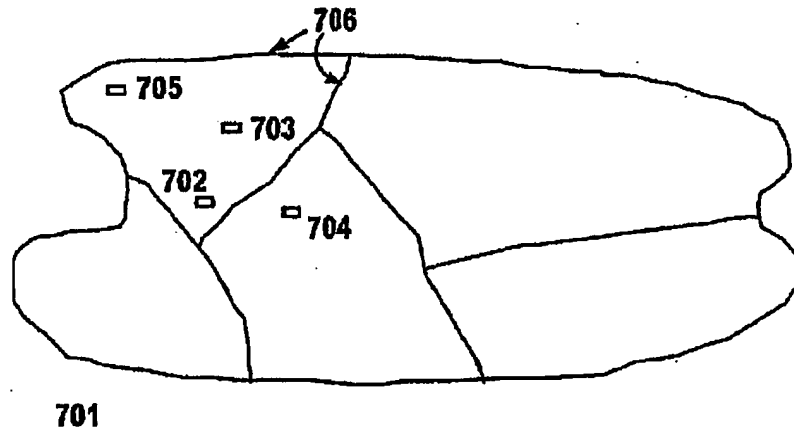


Figure 7

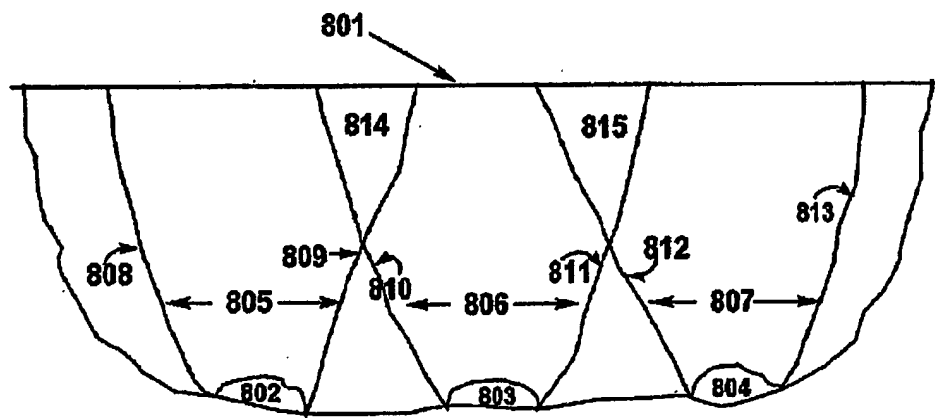


Figure 8

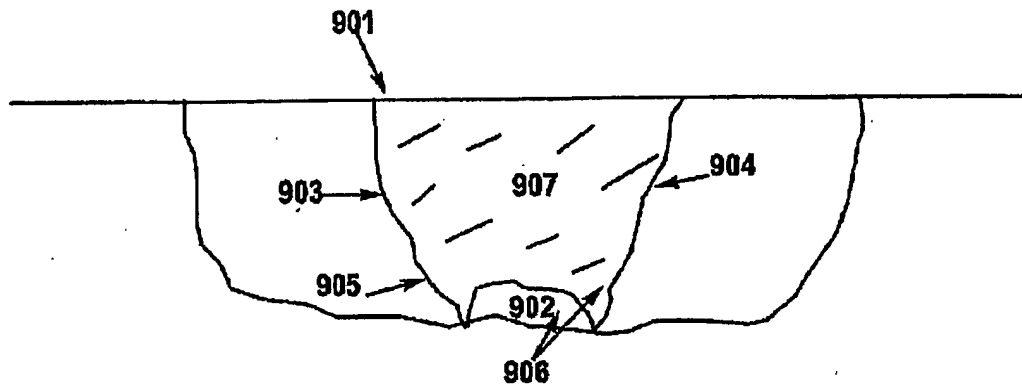


Figure 9

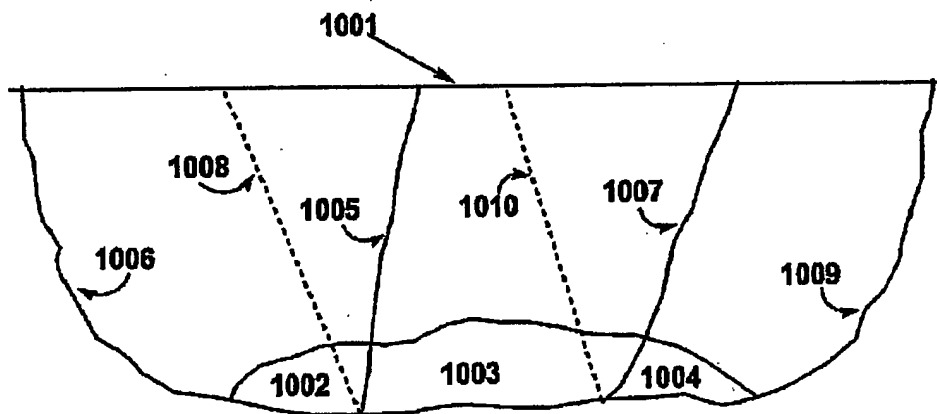


Figure 10

Plan view : 2D block slice

1	8	13	2	3
11	9	14	4	6
10	12	15	7	5

Figure 11a

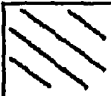

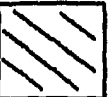
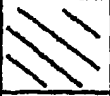
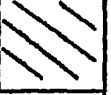

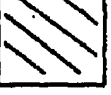
				
				
				

Figure 11b



= cluster #1



= cluster #2




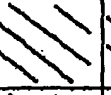
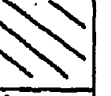
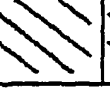

				
				
				

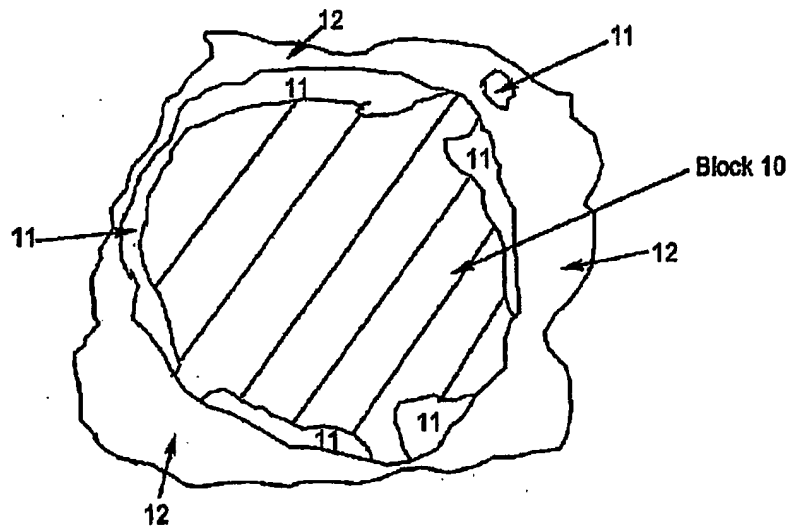
Figure 11c



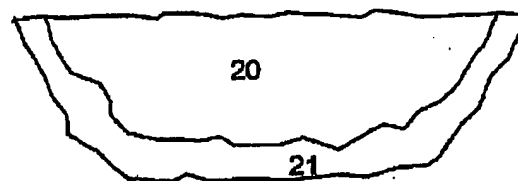
= cluster #1



= cluster #2

**FIGURE 12**

View from above identifying blocks included in the true ultimate pit but omitted by the LP relaxation of the aggregated formulation

**Figure 13**

Vertical cross-section of the exact ultimate pit found for first mine example

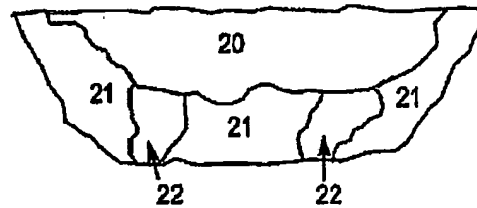


Figure 14

Vertical cross-section of the ultimate pit found using the LP relaxation of the aggregated formulation of the first mine example

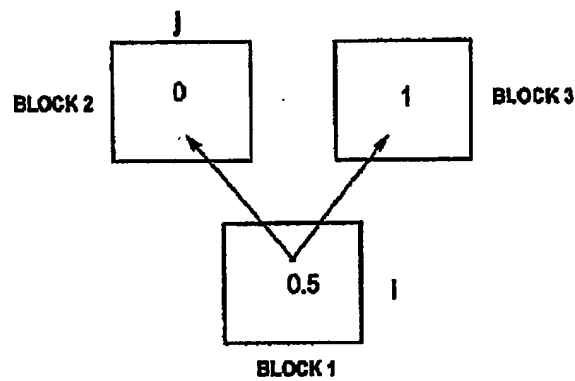


FIGURE 15

Example of feasible solution for LP relaxation of aggregated formulation that is infeasible for the exact formulation

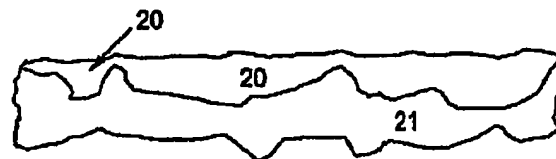
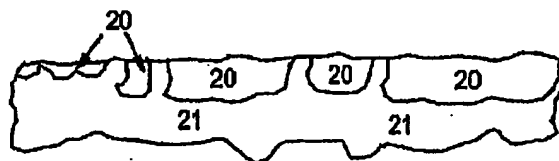
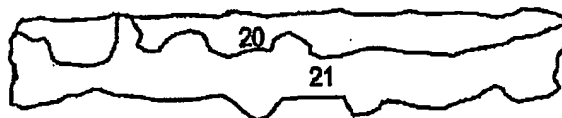


FIGURE 16

Vertical cross-section of the exact ultimate pit found for the third mine example

**FIGURE 17**

Vertical cross-section of the ultimate pit found using the LP relaxation of the aggregated formulation for the third mine example

**FIGURE 18**

Vertical cross-section of the exact ultimate pit found for the third mine example

**FIGURE 19**

Vertical cross-section of the ultimate pit found using the LP relaxation of the aggregated formulation for the third mine example